Process Outline for
Initial Independent Cost Evaluation (ICE)
of EOSDIS

For Period of Performance 11/15/95 to 3/29/96

(Deliverables 7.1-01, 02, 03)

December 27, 1995

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1.   SCOPE

This document has been written to address the first three deliverables under Task 7 of the EOSDIS IV&V contract. Specifically, the document provides:

- A high level outline of the analysis steps to be conducted for the Independent Cost Evaluation (ICE) of the EOSDIS (Deliverable 07.1-01). These activities are scheduled to occur from November 1995 through March 1996.

- A listing of team members and contractor points of contact (Deliverable 07.1-02).

- A preliminary list of documents needed for analysis (Deliverable 07.1-03).

2.   INTRODUCTION

The ICE is intended to offer an independent assessment of what the EOSDIS costs should be when compared to industry standards for the development to-date (through the end of GFY 1995), as well as for future development, maintenance, and operations through GFY 2000. Due to the current instability of several system components, the initial evaluation (through March 1996) will not assess the entire EOSDIS, but rather will focus on the following key areas:

- ECS System/Software Development and Sustaining Engineering

- ECS Hardware

- GSFC DAAC Maintenance and Operations (M&O)

Future options include conducting system/software and hardware development evaluations for the EDOS and EBNet components, as well as M&O evaluations of the remaining DAACs.

Two independent subcontractors have been selected to perform the initial analysis, which has been divided into three subtasks as indicated above. The ECS System/Software Development and Sustaining Engineering assessment will be performed by Software Productivity Research (SPR). The remaining two subtasks (i.e., ECS Hardware Development and GSFC DAAC M&O) will be performed by Real Decisions / Gartner Group. (For a complete listing of team members and points of contact, please see Appendix A.)

Intermetrics will facilitate the efforts of these subcontractors by enabling them to access key personnel and documentation, and by assisting in the interviewing and information-gathering process. In addition, Intermetrics will summarize each analysis and roll up the data to provide overall results.

Intermetrics' goal will be to obtain an estimate for the total cost of the EOSDIS through GFY 2000. A cost matrix will be developed to identify the various EOSDIS cost elements by GFY. In

order to provide a complete cost profile within the March timeframe, Intermetrics will use pre-existing estimates from within the ESDIS Project for those cost elements which were not independently evaluated. The matrix will clearly distinguish between costs that were independently estimated and costs that were internally (i.e., NASA) estimated. A strawman matrix is illustrated in Exhibit 2-1.

ACTIVITY	Costs to Date (GFY95)	GFY96	GFY97	GFY98	GFY99	GFY00	TOTAL
System Development Costs							
ECS Sys/Software Dev Costs							
EDOS Sys/Software Dev Costs							
EBNet Sys/Software Dev Costs							
System Hardware Costs							
ECS Hardware Costs							
EDOS Hardware Costs							
EBNet Hardware Costs							
Sys Integration and Test Costs							
EOSDIS SI&T Costs							
Maintenance & Ops Costs							
ECS M&O Costs							
GSFC DAAC							
LaRC DAAC							
MFSC DAAC							
JPL DAAC							
NSIDC DAAC							
EROS DAAC							
SARASF DAAC							
ORNL DAAC							
CIESEN DAAC							
EDOS M&O Costs							
EBNet M&O Costs							
Management Costs							
ESDIS Program Mgmt Costs							
GRAND TOTAL:							

EXHIBIT 2-1: High Level Cost Matrix for EOSDIS Through GFY 2000

The section that follows delineates the analysis steps to be taken under each of the ICE subtasks.

3. ANALYSIS STEPS FOR THE ICE EFFORT

3.1 ECS System/Software Development and Sustaining Engineering Assessment

The technical approach that Software Productivity Research (SPR) will employ during this engagement draws upon a methodology that has evolved over the last ten years. During this period, SPR has developed a large and comprehensive knowledge base on the major factors that influence software development performance. This knowledge base has been gathered from thousands of projects worldwide.

The knowledge base is also embedded in Checkpoint®, the company's software estimation tool. This tool will be used extensively during the Estimation Phase of this engagement. One of the unique features of SPR's approach to software estimation comes from their ability to correlate and quantify the impact that qualitative factors such as personnel, technology, process and environment have on the quantitative factors of productivity and quality.

In broad terms, this assessment will be conducted in three steps or phases:

   a. Data Gathering Phase

   b. Estimation Development Phase

   c. Deliverable Phase

During the Data Gathering Phase, SPR will develop a comprehensive understanding of the overall ECS development effort, as well as each project associated with the subsystems. Project level data will be collected on function point sizing, project attributes, languages, labor and other costs, and project constraints (associated with scheduling and personnel).

In the Estimation Phase, SPR will input the information gathered in the earlier phase into the Checkpoint tool. Checkpoint will access its knowledge base to develop project estimates. This knowledge base will be augmented through the creation of Checkpoint Templates which will use historical information gathered from the ECS project teams to develop future estimates. By using the Templates, SPR will be able to simply modify Checkpoint for known environmental, technology, personnel or process changes expected during future development, but start with the known ECS productivity and quality rates. This approach will generate inherently more accurate project estimates.

Once all the preliminary subsystem estimates (both development and sustaining engineering) are developed, they will be rolled up into an ECS view and partitioned by government fiscal year.

In the Deliverable Phase, SPR will prepare a comprehensive report supporting their final estimates. This report will include estimates relating to the following:

- **Detailed Development Estimates** - For each subsystem included in ECS (based upon actual or anticipated contractor environmental characteristics), an estimate for each of the following will be developed:

Segment	GFY95	GFY96	GFY ...	Total
SCDO Total	_____	_____	_____	
Rel A	_____	_____	_____	
Rel B	_____	_____	_____	
Rel C	_____	_____	_____	
FOS Total	_____	_____	_____	
Rel A	_____	_____	_____	
Rel B	_____	_____	_____	
Rel C	_____	_____	_____	
Total	_____	_____	_____	

- **Detailed Sustaining Engineering Costs** - For each subsystem included in ECS (based upon actual or anticipated contractor environmental characteristics), maintenance estimates will be developed to support each of the development estimates above.

- **COTS Estimates -** For COTS, actual purchase costs and maintenance fees will be used, as well as cost estimates for integrating those COTS that add functionality into the ECS releases.

- **Detailed Industry (*Should Cost*) Estimates** - For each subsystem included in ECS (based upon industry experience for similar applications).

Below is a more detailed discussion of the steps that will be used to conduct this assessment.

Step 1: Data Gathering Phase

General System Understanding - During this activity, a team of SPR experts will develop a detailed understanding of the ECS project through documentation reviews and interviews with ECS development personnel.

Function Points/Complexity - This activity represents one of the single biggest efforts for this assessment. Because size has a significant impact on the accuracy of an estimate, this activity is also among the most critical.

Function points give software engineers a way of sizing software by analyzing the functionality of the system from the user's point of view. Function points are particularly useful during the planning and estimation phase of an engagement because they provide a way of predicting the number of source code statements that must be written for a program or system.

Function points are a synthetic metric incorporating the visible external aspects of

software consisting of the inputs to an application, the outputs from it, inquiries by users, the data files that would be updated by the application, and the interfaces to other applications. Empirical weighting factors are assigned to each of the five items. (Inputs have an average weight of 4, outputs 5, inquiries 4, data file updates 10 and interfaces 7. These weights represent the approximate difficulty of implementing each of the five factors.) A complexity adjustment is also applied to the final function point total.

SPR will use International Function Point User Group (IFPUG)-certified function point consultants to count all applications. They will perform the counts by reviewing documentation that describes the system functionality. The understanding that is developed will be augmented by discussions with knowledgeable system development personnel.

SPR will utilize a calibrated "Backfire" technique to estimate function points on the COTS component of ECS. This practice will allow them to obtain a function point estimate on a very large body of code with minimal effort.

The use of backfiring is very common for performing retrospective analysis of large, existing applications. Backfiring is based on empirical observations of software systems where both function points and logical source code statements have been counted. For every programming language, there is a characteristic number of source code statements required to encode one function point.

There are, of course, ranges due to individual programming styles. Therefore, backfiring is not as accurate as normal forward function point counting. The accuracy level is increased when the backfiring is calibrated. This procedure is accomplished by manually counting the function points for a sample of the systems or subsystems to verify the KLOC-to-function point ratio.

Project Attributes - During this activity, SPR will collect a significant amount of information at the project team level regarding all the factors which can influence the development performance (quality and productivity). This information will be collected by an SPR consultant during consensus-driven project team meetings.

Project attribute information forms a detailed description of each ECS development environment and assists Checkpoint to assign accurate productivity and quality levels during the estimation phase.

The attribute information covers the broad areas of personnel, process, technology, and environment. Each attribute is rated on a scale of 1.00 to 5.00 with the midpoint value of 3.00 calibrated as the average or typical response. An entry of between 1.00 and 2.00 usually means that quality and productivity will be enhanced. On the other hand, an entry between 3.01 and 5.00 usually reflects decreased quality and productivity in the final estimate.

Step 2: Estimation Development

General Overview - As previously mentioned, Checkpoint will be used extensively to develop detailed subsystem estimates. Checkpoint has been used by many Fortune 500 companies, commercial software developers, and government organizations for the past seven years to estimate with great accuracy large, complex, software applications.

SPR will access Checkpoint's existing knowledge base to develop the Industry or Should Cost estimates, and Checkpoint's knowledge base will be augmented with Templates to develop the ECS project cost estimates. Checkpoint Templates will encapsulate ECS historical performance characteristics and will insure that ECS estimates are developed from actual historical experience unique to the ECS environment.

The detailed estimates that SPR develops will mirror the manner in which the ECS project is evolving. For example, IR-1 is close to completion; therefore, they will capture the actuals to date in Checkpoint and estimate the remaining effort. They will then size the enhancements associated with upcoming releases and, using the Checkpoint Templates, will estimate the effort and costs associated with each of these releases.

Modeling Capabilities - There will be three estimates for each subsystem: (1) an ECS estimate, (2) a Should Cost estimate, and (3) a maintenance estimate. If the Government is concerned about the variances between these estimates, SPR will be able to suggest changes to the existing development environment to reduce the variance. This process can be performed efficiently within Checkpoint because it is a software modeling environment. SPR will simply change some of the input parameters and examine the impact of schedule, effort, cost, and quality.

Quality Prediction - At the core of SPR's methodology is the conviction that quality drives productivity. Their knowledge base includes a significant volume of quality metrics which allows them to examine the impact of the quality assurance processes on development and maintenance resource requirements. As a result, Checkpoint predicts defects (potential and delivered) and can estimate the impact of poor quality on future maintenance commitments.

All of the estimates developed during this assessment will include defect predictions. If defects or maintenance costs exceed desired levels, SPR can help the Government model a quality assurance program within Checkpoint that meets expectations.

Step 3: Deliverable Phase

SPR will participate in the scheduled Information Exchange meetings to describe their estimating approach, methodology, and analysis techniques. SPR will also provide a formal oral briefing at the conclusion of this analysis and a written report documenting the analysis and the results of this evaluation.

3.2   ECS Hardware Assessment

Real Decisions / Gartner Group will employ the following steps in conducting the ECS hardware development analysis:

Step 1: Preparatory Work

The Gartner Group project team will compile a list of all document types and information items that will be required to complete this assessment. This list will include detailed hardware configuration layouts and take-off lists for each release for each DAAC, as well as the discount structures schedule which should be applied to the hardware costs. The list will reflect Gartner's need to assess a total of eight DAACs, each undergoing three configurations (i.e., three releases).

Step 2: Data Collection

The Gartner Group will gather any external data they feel may be needed and relevant to the assessment. This step will also include discussions with other Gartner Group analysts to examine the latest Gartner Group research and opinions with regard to expected cost trends through the year 2000 for the hardware classes under consideration.

Step 3: Model Building

Once all the data has been gathered, the Gartner Group will construct a model based upon their trend projections. This model will be used as a vehicle for consolidating all relevant data and trend projections.

Step 4: Data Analysis

The model mentioned above will be used by the Gartner Group project team to perform its analysis and cost projections. These cost projections will, necessarily, be based upon a number of different factors, some of which may vary significantly and unpredictably over the time horizon being examined.

Step 5: Intermediate Reviews

The Gartner Group Project Leader will meet with Intermetrics twice during the course of the project to discuss progress, obstacles, and other status information. Members of the Gartner Group Consulting Service will also be available by phone and E-Mail for consultations on an "as needed" basis.

Step 6: Review of Findings

Gartner Group will participate in the scheduled Information Exchange meetings to describe their estimating approach, methodology, and analysis techniques. Gartner Group will also provide a formal oral briefing at the conclusion of this analysis and a written report documenting the analysis and the results of this evaluation.

3.3   GSFC DAAC Maintenance and Operations (M&O) Assessment

Real Decisions / Gartner Group will employ the following steps in conducting the GSFC DAAC Maintenance and Operations(M&O) analysis:

Step 1: Preparatory Work

Real Decisions will meet with Intermetrics to review the data collection questionnaire and to clarify the level of detail needed to conduct the assessment. Intermetrics will act as the data gathering agent for Real Decisions. Intermetrics will also provide Real Decisions with any relevant documents needed to ensure a foundational understanding of GSFC DAAC operations. Such documents include Release A/B Design Specifications and information from the ECS Technical Baseline. (See Appendix B for a preliminary listing of documents needed for the entire ICE effort.)

Step 2: Data Collection

Intermetrics will administer the questionnaire to appropriate personnel at the GSFC DAAC, including but not limited to the Financial Analyst, the Technical Manager, the Resource Analyst, and the Operations Manager. (See Appendix C for a copy of this questionnaire.) The questionnaire will be answered through direct inputs from DAAC personnel, interactive interviews with these personnel, and document reviews. Actual data from the past two years of DAAC operations will be collected.

Step 3: Data Input/Refinement

Upon completion of the questionnaire, Real Decisions will input the data into their cost model. Real Decisions will contact GSFC DAAC personnel for clarification questions or will ask Intermetrics to provide responses to their questions to ensure that the inputs to the model are

both complete and accurate. The actuals from the past two years will be used to benchmark and validate the accuracy of the Real Decisions cost model.

Step 4: Data Analysis

The validated cost model will be exercised to predict future M&O costs. These costs will be compared to industry standards / peer systems to determine the DAAC's operational efficiency.

Step 5: Review of Findings

Real Decisions will participate in the scheduled Information Exchange meetings to describe their estimating approach, methodology, and analysis techniques. Real Decisions will also provide a formal oral briefing at the conclusion of this analysis and a written report documenting the analysis and the results of this evaluation.

4. MAJOR MILESTONE SCHEDULE

First Information Exchange Meeting **1/8/96**

Second Information Exchange Meeting **2/2/96**

Third Information Exchange Meeting **2/29/96**

Oral Briefing to Key EOS Stakeholders **3/26/96**

Final Written Report **3/29/96**

<u>APPENDIX A</u>

LIST OF TEAM MEMBERS
AND
CONTRACTOR POINTS OF CONTACT

NAME	COMPANY/AGENCY	ROLE/RESPONSIBILITY	PHONE #/FAX #	E-MAI
Ambardekar, Parag	Hughes	Release A Lead	301-925-0490	pambarde@eos.hit
Armstrong, Mary	Hughes	Multi-Release Lead	301-925-0439	marmstro@eos.hit
Bowyer, Ken	Hughes	SMO Interface	301-925-0320	kbowyer@eos.hitc.
Clinard, Bob	Hughes	SMO Interface	301-925-0315	rclinard@eos.hitc.c
Demcsak, M	Hughes	SCDO		
Dunn, Stan	Hughes	M&O Lead	301-925-0337	stan@eos.hitc.com
Fingerman, Paul	Hughes	Senior Advisor		
Guzek, Joe	Hughes	Chief Engineer	301-925-0339	joe@eos.hitc.com
Horrigan, Bob	Hughes	SCDO	301-925-0700	bobh@eos.hitc.con
Lerner, Ed	Hughes	SCDO Lead	301-925-0303	edle@eos.hitc.com
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Miller, Layne	Intermetrics	ICE Technical Lead	301-982-5414 ext. 265 FAX: 301-982-8902	
Rockwell, Frank	Intermetrics	IV&V Program Manager	301-982-5414 ext. 223 FAX: 301-982-8902	
Saad, Rich	Intermetrics	Task 7 Lead	301-982-5414 ext. 226 FAX: 301-982-8902	rss@cclink.gblt.inn
Banks, Mel	NASA GSFC	ECS Development Lead	301-286-4237	mel.banks@gsfc.na
Barth, George	NASA GSFC	ESDIS Resources Chief	301-286-7297	

Benjamin, Chuck	NASA GSFC	EDOS Lead	301-286-0598	cbenjamin@ccmail v
Blake, Debbie	NASA GSFC	HAIS Interface	301-286-2367	
Broder, Sol	NASA GSFC	General DAAC Interface	301-286-7088	
Chan, Paul	NASA GSFC	GSFC DAAC Primary POC	301-286-0828	
Dalton, John	NASA GSFC	ESDIS Deputy Assoc Director	301-286-5520	john.dalton@gsfc.r
desJardins, Dick	NASA GSFC	EBNet	301-286-8554	
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Herring, Ellen	NASA GSFC	SMO Lead	301-286-9326	ellen.herring@gsfc
Hunolt, Greg	NASA GSFC	General DAAC Lead	301-286-0653	
Lakins, Darryl	NASA GSFC	IV&V COTR	301-286-0082	dlakins@ulabsgi.gs
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Bergstrom, Ken	RD/Gartner	Overall RDC Program Manager		
Johnson, Walt	RD/Gartner	H/W Assessment Program Manager	408-450-4586	
Julian, Diane	RD/Gartner	Ad Hoc RDC Support	410-757-9572	djulian@gartner.co
Kish, Dave	RD/Gartner	DAAC M&O Program Manager	203-316-1111	dkish@gartner.com

Viator, Chuck	RD/Gartner	AD Hoc RDC Support	703-205-3973 FAX: 703-205-3969	cviator@gartner.co
Walton, Bill	RD/Gartner	DAAC M&O		
Cunnane, Michael	SPR	Manager of ECS System/Software Development Assessment	617-273-0140 ext 117 FAX: 617-273-5176	mike@spr.com
Pinis, Mark	SPR	Checkpoint Implementation Expert (ICE)	617-273-0140 FAX: 617-273-5176	mark@spr.com

<u>APPENDIX B</u>

PRELIMINARY LIST OF DOCUMENTS NEEDED FOR ANALYSIS

Document Number	Document Name	Date	Type	Milestone	Release
222-TP-006-002	Release B Document Tree	Oct 95	Tech Paper	IDR	B
231-TP-001-001	COTS Cost Estimation Model for the ECS Project	Dec 94	Tech Paper		
231-TP-002-001	Bill-of-Materials Procurement Cost Model for the ECS Project	Dec 94	CDRL		
305-CD-004-001	Overview of Release A SDPS and CSMS System Design Specification	Jul 95	CDRL	CDR	A
305-CD-014-001	Release A GSFC DAAC Design Specification for the ECS Project	Jul 95	CDRL	CDR	A
305-CD-020-001	Release B SDPS/CSMS Design Overview Specification for the ECS Project	Oct 95	CDRL	IDR-B	B
305-CD-030-001	Release B GSFC DAAC Design Specification for the ECS Project	Oct 95	CDRL	IDR	B
305-CD-040-001	Flight Operations Segment (FOS) Design Specification for the ECS Project (Segment Level Design)	Oct 95	CDRL	CDR	A,B
420-WP-005-001	Interim Release 1 to Release A Transition Plan	Sep 95	White Paper	IDR	A
RFP-ISYS-96-01	Request for Proposal: Independent Cost Evaluation (ICE) of EOSDIS				
	1995 MTPE EOS Reference Handbook				
	EOSDIS IV&V Task 7: Programmatic and Process Analysis Statement of Work	Dec 95	Outline		
	Component Class in RTM Baseline112495	Nov 95	Table		
	EDOS Front End Reshape	Aug 95			
	EBNet Status Briefing	Aug 95			
	ECS Project Organization	Nov 95	Org Chart		

INITIAL DOCUMENT INVENTORY FOR ICE EFFORT

APPENDIX C

CENTRALIZED SYSTEMS AND SERVER ANALYSIS QUESTIONNAIRE

Centralized Systems and Server Analysis
Questionnaire
Version 1.1

Centralized Systems and Server Analysis Questionnaire

Date _____

Company Name _____

Location _____

Analysis Year _____

Client Coordinator _____

Target Completion Date _____

Target Presentation Date _____

Real Decisions
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Darien, Connecticut 06820

(203) 656-1500
(203) 656-1659 FAX

Table of Contents

Comprehensive Questions

1.   How is the support for this environment within the analysis organized within your corporation?

2.   What is the relation of this processing environment to the total data processing within your corporation?

3.   Briefly describe the distribution of the major users of this environment (geographic).

4.   Are there any service level commitments with customers, and if so, what are they?

5.   What are the future plans for this environment? Is it growing? Moving to another platform?

6.   Is the nature of the environment being evaluated Production or Development?

7.   Describe the type of work running in this environment.

8.   What were the main Technology requirements to operate this environment?

        I/O constraints?

        CPU constraints?

        Other?

Configuration

Hardware

1. What is the main manufacturer of processing equipment used at this location? Why was this vendor chosen?

2. What criteria are used to determine requirements for a processor upgrade or replacement?

Please fill in the following table for each individual processor and disk configuration within this study. If a machine was upgraded or replaced during the study period, fill out one page to reflect each configuration. Complete this page for each processor within the analysis.

Processor Type

Manufacturer	
Model	
Install Date	
Physical Configuration	
Memory Mb	
Number of I/O Controllers	
I/O Controller Type	
Number of Processors	
Operation Environment	
Operating System and Version Number	
Database Environment	
Type of Work on System	
Performance Measure	
Example (TPS, MIPSM VUPS, etc.)	

Disk Storage

	Total
Installed MBs	

Configuration, continued

Tape Storage Devices

Type of Drive	# of
Cartridge/Reel (circle one)	
Cartridge/Reel (circle one)	

Output Devices

Printing Devices	# of
Laser/Impact(circle one)	
Laser/Impact(circle one)	
Laser/Impact(circle one)	

Configuration, continued

Software

1.   Do you maintain multiple versions of the same operating systems software?

2.   Are you using homegrown software for management of the production environment because of a lack of available products on the market?

3.   Are there corporate-wide license agreements for certain software packages?

4.   If you support multiple locations, is there a central group that handles software distribution to the other midrange locations?

Please list the number of packages associated with each of the following categories of software.

	# of Packages
Operating System	
System Utilities	
Security	
Database	
Languages	
Development Tools	
Communication Software	

Configuration, continued

Software, continued

For each of the following items, briefly describe the 2 to 3 major packages within that category.

Major Package Name	Vendor	Function
Operating System		
1.		
2.		
3.		
System Utilities		
1.		
2.		
3.		
Security		
1.		
2.		
3.		
Database		
1.		
2.		
3.		
Languages		
1.		
2.		
3.		
Development Tools		
1.		
2.		
3.		
Communication Software		
1.		
2.		
3.		

Backup Procedures

1.   How often are backups done?

2.   What types of backups are executed (full or incremental)?

3.   What data is involved in the backup (total system, or application-specific data files)?

4.   Are there any specific user requirements that are non-essential?

Operations, continued

Availability

Complete the following table regarding availability of the computing environment by major component.

Scheduled Availability	Hours/Day	Days/Week
Major Database Environments		
Network		
Other		

1. How many unscheduled outages have you had in the last 12 months, and how long did they last?

2. For the following functions, please list the hours per day and days per week these areas are staffed.

- First Level Support (Help Desk)

- System Monitoring

- Technical Support

3. Do you utilize a beeper type service for non-staffed timeperiods?

4. What is the most critical time-period of the day?

Operations, continued

Help Desk

1.　What are the responsibilities of the Help Desk?

2.　Is there a tracking package used to manage the problems that are reported?

3.　Approximately how many calls are handled each month?

4.　What percentage of these calls are resolved without having to escalate the problem?

Automated Operations

What Tools/Procedures are in place for automation of the following functions?

Function	Vendor/Product	Purpose
System Console		
Job Scheduling		
Storage Management		
Help Desk		
Other		

Operations, continued

Contingency Planning

1.   Is there a formal Disaster Recovery plan in place? If so, how is it fulfilled?

- Internal Self Recovery
- External Vendor Recovery
- Other?

2.   In addition, if there is a plan:

How much processing power is required to recover those items deemed "critical" ?

Within what timetable is the environment recovered?

Within	Capacity Recovered
4 hours	
8 hours	
12 hours	
1 Day	
2 Days	
1 Week	
More than 1 week	

3.   Is the real cost of an outage in service clearly understood by upper management?

Annual Expenditures

Fill in the following tables with Costs that reflect your actual expenditures for running the processing environment. If some of these Costs are not in your budget area, do not ignore that area, but attempt to get the information from an alternate source. Since this analysis is based on functional definitions, we need to collect all costs associated with the items listed below. Keep in mind that these are fixed costs, and all personnel-related costs (salary, benefits, etc.) will be collected in a separate section Of this document.

Analysis Year ————————————
Start/End Month ————————————

Hardware	Lease	Depreciation	Maintenance	Expense	Taxes
Processors					
Disk					
Print/Tape					
Other					
Total					

Software	Lease	Depreciation	Maintenance	Expense	Taxes
Operating System/Utilities					
Database					
Network					
Other					
Total					

Disaster Recovery	Annual Costs
Hotsite Backup	
Off-site Tape	
Other	
Total	

Annual Expenditures, continued

Occupancy	Annual Costs
Space - Raised	
Space- Office	
Space- Other	

Note - Occupancy costs should include fully-burdened costs for the facility. Some examples would be:

Electricity
Maintenance
Property Taxes
Security
Office Supplies
Other

1.   What is your budget cycle?

2.   What is the depreciation cycle used for purchased equipment, and how long is the typical cycle?

3.   If the equipment is leased, how long is the typical lease agreement?

4.   What kind of warranty terms come with the equipment?

5.   Who is the main supplier of maintenance for the processing equipment?

6.   Are there any unusual accounting practices utilized of which we should be aware?

7.   Do you own the building that is currently occupied?

Personnel

The following section is related to staffing levels and the associated costs for the personnel that fall within the boundaries of this analysis. There are three main categories of staffing:

- Operations
- Technical Services
- Finance/Administration

Please review carefully and adhere to the job descriptions on the following pages.

For each section, enter in the number of Full Time Equivalents related to each particular function. Supply the total costs associated with the people in each section and break down those costs into the categories requested.

Operations and Functions

Category	Number of People
System Operations/Support	
Tape/Print	
Help Desk	
Production Control (Scheduling)	
Management	
Total Staffing	

For the total staffing above, please supply the following associated costs:

Category	Annual Costs
Salaries	
Benefits	
Travel/Training	
Other	
Total Costs	

Personnel, continued

Operations personnel maintain me general mainframe computing environment and the production applications running in that environment.

System Operations/Support

These personnel have responsibility for overall efficient operation of installed computer systems. This includes system start/stops, monitoring system jobs, responding to system requests, diagnosis and correction of system failures, and automation of the production environment.

Help Desk

This area provides first-level responses to client requests for assistance, usually by telephone. If the problem is not routine or cannot be resolved in a short time period, H is forwarded to a more specialized area.

Tape

This area controls, stores and provides tapes that are needed by the users of the processing environment.

Print

These personnel maintain the operating environments of centrally managed printers and microfiche equipment. This includes replacement of all consumables related to the operation of the output devices. It does not include mailing, packaging or delivery of the output.

Production Control

This area maintains the integrity of the production environment by participating in the following tasks:

- Turnover of applications from test into production after the system has been developed and tested
- Ensuring that systems to be placed in the production environment meet certain standards
- Providing job procedural documentation such as scheduling requirements and rerun procedures
- Establishing and adjusting the batch job schedule
- Providing ongoing job monitoring.
- Reviewing the service level of production jobs to improve quality and/or efficiency

Management

This includes personnel with responsibility for two or more of the operations areas listed above. If a manager within your organization has responsibility for only one area, place them in that function.

Personnel, continued

Technical Services and Functions

Category	Number of People
System Management	
Performance	
Capacity Planning	
Storage Management	
System Security	
Disaster Recovery	
Management	
Total Staffing	

For the total staffing above, please supply the following associated costs:

Category	Annual Costs
Salaries	
Benefits	
Travel/Training	
Other	
Total Costs	

Personnel, continued

Technical Services personnel provide, maintain and tune the processing platform.

System Management

This area is responsible for maintaining the operating system and TP (On-Line) environments. This includes evaluation, installation, maintenance (fixes and upgrades), as well as removal of system software, security packages, system utilities and database transaction packages. The personnel establish technical standards, diagnose and resolve system problems, and tune system performance. They do not develop applications or support them once developed.

Performance

This area develops standards and measures for the technical performance of operating systems and major subsystems as follows:

- Identify overall system performance trends and problems that may be used as input to other technical areas
- Target specific applications for performance improvements and work with developers and system programmers to implement
- Recommend workload balancing procedures
- Help establish client service level objectives
- Measure and report on performance relative to system service level objectives
- Report on performance relative to service level agreements

Capacity Planning

This area establishes the performance and capacity thresholds for computer system changes. Technical Services personnel monitor system utilization and forecast capacity needs.

- Evaluate and recommend new hardware
- Plan upgrade schedules

Storage Management

This area works to establish, report on and optimize the utilization of the storage environment.

Responsibilities include the following:

- Determine and use the tools necessary to perform the function
- Physical and logical configurations of disk devices
- Physical placement of data sets
- Establish standards for data set retention, reorganization, and migration

Personnel, continued

System Security

This area develops standards and procedures for ensuring overall system integrity. Responsibilities include the following:

- System access (controlled, for example, by userid and password)
- Standards for file access software (security software)
- Auditing system security and correcting violations

Disaster Recovery

Disaster Recovery personnel are responsible for the development, implementation, maintenance, and testing of disaster recovery (also known as contingency) plans and procedures. This includes managing the data off site for retention purposes.

Management

Personnel with responsibility for two or more of the Technical Services areas listed above. If a manager within your organization has responsibility for only one area, place them in that function.

Personnel, continued

Finance/Administration and Functions

Category	Number of People
Accounting	
Chargeback	
Procurement	
Quality	
Administrative Support	
Management	
Total Staffing	

For the total staffing above, please supply the following associated costs:

Category	Annual Costs
Salaries	
Benefits	
Travel/Training	
Other	
Total Costs	

Personnel, continued

Finance/Administration personnel manage the budget, acquisitions and chargeback related to the processing environment.

Accounting

This area functions in the following ways:

- Establish budget for the data center(s) included in our analysis
- Monitor actual expenses versus budget
- Determine the most economical acquisition methods for hardware and software, i.e., lease versus purchase
- Arrange financing for purchases
- Perform financial reporting to other company areas, e.g., for corporate consolidated budgets

Chargeback Administration

This area establishes procedures for authorizing financial registration of system users. Personnel handle the operation of the chargeback system, if one exists, including invoicing, credits, etc.

System Procurement

This area maintains contact with computer hardware and software vendors. They solicit bids, negotiate purchasing agreements, establish purchase orders, validate vendor bills and coordinate with accounts payable for payment. They are responsible for contract administration.

Quality Management

This area works to improve overall data center quality through audits, process control and training.

Administrative Support

Administrative Support personnel provide direct administrative and clerical support to all data center organizations.

Management

This includes personnel with responsibility for two or more of the Finance/Administration areas listed above. If a manager within your organization has responsibility for only one area, place them in that function.

Operating Environment

Support

Identify which of the following processing environments are used at your location.

	Yes	No
Batch		
Interactive		
Database		
Network		
Other (describe)		

Types of Software Packages

In regards to the database and interactive environments, how many different packages are used within this type of processing? Please list the major packages and database systems utilized (if applicable).

Interactive Products

Product	Brief Description

Database Products

Product	Brief Description

Operating Environment, continued

Workload Characteristics

For each major operating environment, describe the characteristics of the work in that area.

Example:

Database   Order entry/tracking system

Environment	Characteristics
Batch	
Interactive	
Database	
Network	
Other	

Of the applications that are in use today, what percentage was developed internally?

Measurements

In order to understand the amount of work executed within your environment, we need to collect certain data points.

- CPU Time
- Disk MBs
- Printed lines (local - if applicable)

You are asked to supply information by shifts on the following pages. Four shifts are given; if you have more than four shifts, make duplicates of the page. If you have fewer than four shifts, use only the columns that are needed.

Please describe when each shift occurs (e.g., 8:00 am to 4:00 pm):

Description

Shift 1   _____

Shift 2   _____

Shift 3   _____

Shift 4   _____

Complete the following pages for each processor installed.

Measurements, continued

Processor Utilization

In order to get an accurate picture of the overall CPU activity of the computing environment, fill out the following tables. You are requested to supply CPU Busy by shift for both an average weekday and weekend.

Time Period: _____

Processor: _____

Average WEEKDAY

	Shift 1	Shift2	Shift 3	Shift4
Average Weekday % CPU Busy				

Indicate the percentage of work done in each environment by shift.

Profile of Work	Shift 1	Shift2	Shift 3	Shift4
Batch				
Interactive				
Database				
Network				
Other				
	100%	100%	100%	100%

Measurements, continued

Processor Utilization, *continued*

Time Period: _____
Processor: _____

Average WEEKDAY

	Shift 1	Shift2	Shift 3	Shift4
Average Weekday % CPU Busy				

Indicate the percentage of work done in each environment by shift.

Profile of Work	Shift 1	Shift2	Shift 3	Shift4
Batch				
Interactive				
Database				
Network				
Other				
	100%	100%	100%	100%

Other Devices

Disk Storage (megabytes)

Element	Megabytes
Total Installed MBs	
Used(occupied) MBs	

Tape

Element	Mounts
Total Tape Mounts	

Printed Output (local)

Element	(000s) Lines
Total Printed Lines	

Activity Measures

Complete the following table. Make additional copies for each processor included in the analysis.

Transaction Activity

Time Period: _____
Processor: _____

Definition of a Transaction - A transaction is a database transaction as collected by the database monitoring package of the system.

Element	Unit of Measure	Shift 1	Shift2	Shift 3	Shift4
# Transactions/hour (avg.)					
# Transactions/hour (peak)					
Total Transaction/Month					

User Activity

Time Period: _____
Processor: _____

Element	Unit of Measure	Shift 1	Shift2	Shift 3	Shift4
# Active Users/hour (avg.)					
# Active Users/hour (peak)					
Total # of Accounts (userids)					

Activity Measures, continued

Batch Activity (if applicable)

Time Period: _____
Processor: _____

Element	Unit of Measure	Shift 1	Shift2	Shift 3	Shift4
# Batch Jobs/hour (avg.)					
# Batch Jobs/hour (peak)					
Total Batch Jobs/Month					

User Survey

Company   _____

Department   _____

System used   _____

For each question check only one box.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Relevant
The availability of the operating environment is acceptable.						
The applications I use are very reliable (not likely to fail during use).						
The applications I use are valuable for use when I need them.						
The Help Desk staff is very responsive to my requests.						
The technical expertise of the Help Desk staff is good.						
The functionality of the applications meet my needs.						
The applications that I use are user friendly.						
The response time of the system is acceptable.						